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POTENTIAL IMPACT OF ANDRASSY BENTONITE MICROBIAL DIVERSITY IN THE LONG-TERM PERFORMANCE OF A DEEP NUCLEAR WASTE REPOSITORY

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Abstract

Copper and steel canning and bentonite buffer are normally forseen as the primary containment component of a deep nuclear waste repository. Distribution of microbes in subsurface environments have been found to be extensive and directly or indirectly may exert influence on waste canister corrosion and the mobility of radionuclides. The understanding of clays and microbial interaction with radionuclides will be useful in predicting the microbial impacts on the performance of the waste repositories. The present work characterizes the culture-dependent microbial diversity of Andrassy bentonite recovered from Tawau clay deposits. The evaluation of microbial populations shows the presence of a high number of cultivable microbes (e.g. Staphylococcus, Micrococcus, Achromobacter, Bacillus, Paecilomyces, Trichoderma, and Fusarium). Additionally, a pigmented yeast strain Rhodotorula mucilaginosa was also recovered from the formation. Both Bacillus and Rhodotorula mucilaginosa have high tolerance towards U radiation and toxicity. The presence of Rhodotorula mucilaginosa in Andrassy bentonite might be able to change the speciation of radionuclides (e.g. uranium) in a future deep repository. However concern over the presence of Fe (III) reduction microbes such as Bacillus also found in the formation could lead to corrosion of copper steel canister and affect the overall performance of the containment system.

Keywords: bentonite, radioactive waste disposal, microbes, microbiological corrosion, radionuclides